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Pathways between perceived discrimination and health among immigrants:evidence from a large national panel survey in Germany

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Objective. Discrimination is an important determinant of health, and its experience may contribute to the emergence of health inequalities between immigrants and nonimmigrants. We examine pathways between perceived discrimination and health among immigrants in Germany: (1) whether perceptions of discrimination predict self-reported mental and physical health (SF-12), or (2) whether poor mental and physical health predict perceptions of discrimination, and (3) whether discrimination affects physical health via mental health.
Design. Data on immigrants come from the German Socio-Economic Panel (SOEP) from the years 2002 to 2010 (N = 8,307), a large national panel survey. Random and fixed effects regression models have been estimated.
Results. Perceptions of discrimination affect mental and physical health. The effect of perceived discrimination on physical health is mediated by its effect on mental health.
Our analyses do not support the notion that mental and physical health predict the subsequent reporting of discrimination. Different immigrant groups are differentially exposed to perceived discrimination.
Conclusion. In spite of anti-discrimination laws, the health of immigrants in Germany is negatively affected by perceived discrimination. Differential exposure to perceived discrimination may be seen as a mechanism contributing to the emergence of health inequalities in Germany.
Keywords: discrimination; immigrants; health; longitudinal data analysis; fixed effects; Germany

Introduction

Health disparities between immigrants and nonimmigrants may arise from numerous sources (Schenk 2007; Razum et al. 2008): socioeconomic position, access to health care, health behavior, risks, and resources acquired in the countries of origin, and not the least because of discrimination in the receiving country (Pearlin et al. 2005; Williams and Mohammed 2009).
Although Germany is among Europe's most important receiving countries, with its share of foreign-born persons in the population being above that of the USA (OECD 2012; Schunck 2014), there is little knowledge regarding the prevalence and consequences of perceived discrimination among immigrants in Germany (but see Igel,

Brahler, and Grande 2010). Anti-immigrant attitudes may not be particularly high in Germany, as compared to other European countries (Strabac and Listhaug 2008; Meuleman, Davidov, and Billiet 2009), but they are present, suggesting that immigrants may indeed face discriminatory behavior.

Among the German population, almost 20% (about 16 million persons) have a migration background (Federal Statistical Office of Germany 2012). The immigrant population comprises mostly (descendants of) labor migrants, who came to Germany during the reconstruction after the World War II, ethnic German immigrants or resettler (German: '(Spät-)Aussiedler ') from former Eastern Bloc countries, and an increasing share of (temporary) intra-European labor migrants (Schunck 2014; Federal Statistical Office of Germany 2012).

Population-based studies indicate differences in mortality and morbidity of immi¬grants compared to the nonimmigrant population in Germany (Razum et al. 2008). However, results differ substantially with regard to the specific immigrant group and the health outcome under study. In terms of subjective health, there is little evidence for substantial differences between immigrants and nonimmigrants in Germany (Lindert et al. 2008; Razum et al. 2008; Volodina et al. 2011; Igel, Brahler, and Grande 2010). However, studies indicate poorer mental health (i.e. in terms of mental disorders, depression, or psychological distress) among immigrants compared to nonimmigrants, in particular regarding immigrants of Turkish origin (Carta et al. 2005; Lindert et al. 2008). Yet, previous studies also found differences between Turkish immigrants and resettlers compared to the nonimmigrant German population regarding, e.g. a lower incidence and mortality from cardiovascular diseases and cancer, although there are strong site- and sex-specific differences (Spallek et al. 2012; Winkler et al. 2009; Deckert et al. 2014).

One mechanism that can contribute to health disparities between immigrants and nonimmigrants is discrimination. Discrimination refers to unfair and ostracizing treatment of groups that are characterized by a common feature (e.g. ethnicity, skin color, gender, sexuality, disability, and religion; Krieger 2001; Allport 1954). Discriminatory behavior can take a variety of different forms, ranging from subtle disrespect in everyday interactions to the denial of scarce resources, e.g. jobs, or even violence (Gee and Walsemann 2009; Krieger 2001). The association of perceived discrimination, in general, and ethnic discrimination, in particular, with adverse health outcomes has been well documented in several international studies and reviews (Paradies 2006; Priest et al. 2012; Kelaher et al. 2008; Harris et al. 2012; Bhui et al. 2005; Alvarez-Galvez and Salvador-Carulla 2013; Agudelo-Suarez et al. 2011; Harris et al. 2006; Pascoe and Richman 2009; Williams and Mohammed 2009; Williams, Neighbors, and Jackson 2008; Kim and Williams 2012). The most frequently discussed pathway conceptualizes discrimination operating as stressor or stressful life event which can cause poor mental and physical health (Kessler, Mickelson, and Williams 1999; Pearlin et al. 2005). Stress models suggest that discrimination elicits strong negative affective states, generating psychological distress, which in turn can affect biological processes and thus negatively impact health (Chae et al. 2012; Clark et al. 1999; Cohen, Kessler, and Gordon 1995; Gallo and Matthews 2003; McClure et al. 2010).

Although the vast majority of research, including the only German study (Igel, Brahler, and Grande 2010), is cross-sectional with exposure and outcome being measured simultaneously, more and more studies also use longitudinal data to investigate pathways

linking perceived discrimination and health outcomes (Brody, Kogan, and Chen 2012; Pavalko, Mossakowski, and Hamilton 2003; Schulz et al. 2006; Barnes et al. 2008).
However, there are alternative pathways which could produce the association between perceived discrimination and adverse health outcomes. It may be possible that poor health actually operates in the reverse direction. In other words, health affections may make it more likely that individuals interpret interactions as discriminatory (Gee and Walsemann 2009; Pavalko, Mossakowski, and Hamilton 2003). There are still few studies which jointly investigate these competing pathways.
Therefore, the aim of our study is to investigate (1) whether perceptions of discrimination predict self-reported mental and physical health in Germany; or (2) whether poor mental and physical health predict perceptions of discrimination; and (3) whether discrimination effects physical health via mental health. We investigate five main hypotheses as displayed graphically in Figure 1. Hypotheses 1 and 3 depict the most commonly discussed direction of the pathway, namely, an assumed causal pathway from perceived discrimination to adverse physical and mental health outcomes. Hypotheses 2 and 4 show the alternative pathway, that is, from adverse health outcomes to perceived discrimination. Discrimination is assumed to affect physical health through negative emotional reactions (Cohen, Kessler, and Gordon 1995). Negative emotions may trigger psychological stress reactions, such as anxiety or depression, which are followed by

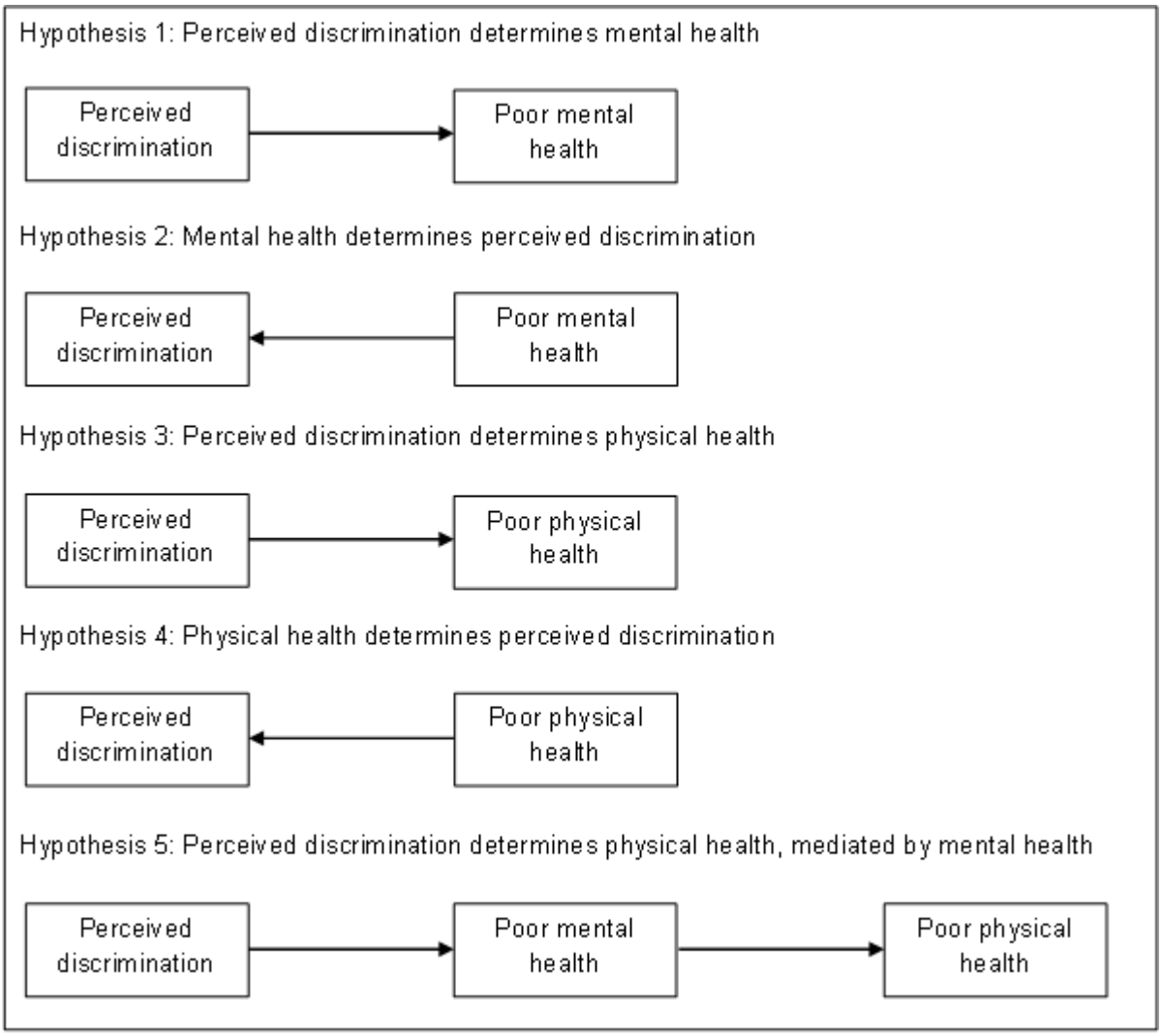

Figure 1. Potential pathways between perceived discrimination and health outcomes.

physiological responses and in turn may adversely affect health (Chae et al. 2012; Clark et al. 1999; Cohen, Kessler, and Gordon 1995; Gallo and Matthews 2003; McClure et al. 2010). If this is the case, then the effect of perceived discrimination on physical health should be mediated by its effect on mental health (Hypothesis 5). Taking into consideration the reported heterogeneities among the immigrant groups in Germany, we additionally test if differential vulnerability between immigrant groups (Kessler, Mickelson, and Williams 1999) leads to group-specific effects of perceived discrimination.

Methods

Data source

Our data source is the German Socio-Economic Panel (SOEP), an ongoing, represent-ative, large-scale longitudinal survey of households in Germany running since 1984 (Wagner, Frick, and Schupp 2007). The SOEP data-set is available for secondary analyses. It comprises several subsamples, two of which have been designed especially to represent the immigrant population in Germany. Since the SOEP covers a wide range of topics including self-reported physical and mental health and sections on immigrant integration, it is well suited for the investigation of immigrant health in Germany (see, e.g. Razum et al. 2008).

Definition of the study population

We focus on immigrants defined as persons who were born abroad and who have immigrated to Germany (sometimes also referred to as first-generation immigrants). Immigrants in the SOEP are identified through combining information on their country of origin and their nationality, allowing to differentiate between naturalized immigrants and immigrants with foreign nationality. The sample covers the major immigrant groups in Germany, in particular the so-called former ‘guest workers' as well as newer immigrant groups, among them ethnic German immigrants (resettlers) from former Eastern Bloc countries and intra-European immigrants. We are thus able to differentiate between immigrants originating from Turkey, from former Yugoslavia, from Greece, Italy, Spain or Portugal, from East-European countries including Russia and former Soviet countries, and from other countries of origin combined.

Measures

Health

Starting in 2002, the SOEP has included a version of the Short Form 12 Health Questionnaire (hereafter SF-12) to measure self-reported physical and mental health on a biennial basis (Andersen et al. 2007). The SF-12 may be used in different national contexts (Gandek et al. 1998). What is most important for this study, it also delivers valid and comparable information on the health status of immigrants (Schulz 2012). The standard scoring method to compute the Physical Health Component Summary Score (hereafter PCS) and the Mental Health Component Summary Score (hereafter MCS) out of the 12 items is based on the assumption that these two components are uncorrelated (Ware et al. 2002). However, as indicated above, physical and mental health may be

interrelated (Clark et al. 1999). Indeed, research on SF-12 and SF-36 indicates that the two components, mental and physical health, are actually correlated. Using the original orthogonal scoring methods to compute PCS and the MCS may, therefore, lead to inconsistent results (Schulz 2012; Taft, Karlsson, and Sullivan 2001; Wilson, Parsons, and Tucker 2000). Thus, we followed the suggestions in the literature (Wilson, Parsons, and Tucker 2000; Schulz 2012) and employed a confirmatory factor analysis to compute the summary scores on the full SOEP sample (results available on request), allowing for correlations between the two components. Both summary scores have been standardized to having a mean of 50 and a standard deviation of 10.

Perceived discrimination

The SOEP covers subjective experiences of discrimination with a single item, asking respondents how frequently they have experienced discrimination because of their origin in the last two years. Respondents can indicate that they (1) have never; (2) seldom; or (3) often experienced discrimination. Because the item refers to the last two years, this matches the biennial rhythm of the SOEP SF-12.

When testing for potential reverse causality, we recoded the discrimination variable from the next period (t + 1) into a binary indicator with never experienced discrimination vs. seldom/often experienced discrimination (the results are robust to different coding schemes, e.g. never/seldom vs. often; results available on request). This leads to a reduction in sample size because not all respondents observed at t are also observed at t +1 (follow-up rate see below).

Socioeconomic position and demographics

Socioeconomic position is assessed through respondents' labor force status (nonworking, working, and unemployed), the SOEP's implementation of the International Standard Classification of Education (in school, inadequately completed and general elementary, middle vocational, vocational plus university-entrance diploma [German: Abitur], higher vocational, higher education), and income quintiles based on the equalized disposable income (modified OECD scale). We included age, marital status, gender, as well as a binary variable indicating that respondents have acquired the German nationality.

Study sample

We included all foreign-born respondents ages 17 years or older. Nonmigrants are excluded as the question on perceived discrimination is only directed to immigrants. The average follow-up rate across our observation period (2002-2010) is 84.8%. Item nonresponse on the study variables is relatively low. Highest item nonresponse is found with the education variable at 3.98%. After excluding cases with missing values, the final longitudinal sample comprises 8307 observations coming from 2851 respondents (Table 1). The sample is unbalanced, i.e. allowing for different numbers of observations per respondent (average: 2.9 observations per respondent). Collinearity among the study variables is reasonably low (mean variance inflation factor = 2.45).

Table 1. Characteristics of the immigrant sample (SOEP 2002-2010).

	Full sample	Perceived discrimination[a]		
		Often	Seldom	Never
	(n = 8307)	(n = 500)	(n = 2846)	(n = 4961)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Health				
SF12: Summary scale mental health (MCS)	49.8 (10.3)	44.6 (12.1)	48.1 (10.3)	51.3 (9.84)
SF12: Summary scale physical health (PCS)	49.8 (10.2)	45.7 (11.3)	48.7 (9.78)	50.8 (10.1)
Perceived discrimination in the last two				
Often	0.06			
Seldom	0.34			
Never	0.60			
Demographics				
Age	46.5 (14.9)	43.3 (13.9)	45.1 (13.8)	47.6 (15.5)
Gender				
Male	0.49	0.54	0.49	0.48
Female	0.51	0.46	0.51	0.52
Marital status				
Single	0.11	0.09	0.10	0.13
Married	0.80	0.83	0.83	0.78
Other marital status	0.09	0.09	0.08	0.09
Nationality				
German	0.39	0.34	0.37	0.41
Other	0.61	0.66	0.63	0.59
Socioeconomic position				
Labor force status				
Nonworking	0.35	0.35	0.33	0.36
Working	0.57	0.51	0.57	0.58
Unemployed	0.08	0.14	0.10	0.06
Equalized disposable household income				
1. Quintile	0.33	0.46	0.37	0.29
2. Quintile	0.24	0.27	0.24	0.23
3. Quintile	0.19	0.14	0.19	0.19
4. Quintile	0.13	0.09	0.11	0.15
5. Quintile	0.11	0.03	0.09	0.13
Level of education				
In school	0.01	0.01	0.02	0.01
Inadequately completed/general elementary	0.33	0.35	0.35	0.32
Middle vocational	0.36	0.37	0.33	0.37
Vocational + 'Abitur' (university entrance degree)	0.09	0.09	0.09	0.09
Higher vocational	0.06	0.05	0.05	0.06
Higher education	0.16	0.14	0.16	0.16

[a]Columnwise distributions.

Statistical analysis

The analyses proceed in two parts. The first set of analyses tests the potential pathways through which perceived discrimination may affect self-reported mental and physical health. To that end a series of random effects (random intercept) and fixed effects regression models have been computed. Both classes of models are suited for the analysis of longitudinal data but have different advantages and shortcomings. Random effect

models incorporate respondent-specific difference by allowing for respondent-specific differences in the intercept (through the Level 2 error ui). This may account for constant differences between respondents in their value of the dependent variable. In the linear
case, this model is given as $y_{it} = \alpha + \beta x_{it} + u_i + \varepsilon_{it}$. This model rests on the assumption that the random effect (u_i) is uncorrelated with the explanatory variables (Wooldridge 2010). To put it differently, random effects models assume that respondents do not differ in any (time constant) unobserved characteristics that affect both health and any of the covariates. These time constant differences can, for instance, encompass fixed personal or biological predispositions for illnesses, as well as all aspects that lie in the individual's biography, such as one's migration history. Obviously, it is hard to rule out that any time-constant unobserved characteristic simultaneously affects health and, for instance, the probability to experience discrimination. If this is not met, the estimated coefficients are biased (Wooldridge 2010).
Fixed effects models (also known as change score models) present an alternative. The fixed effects estimator is usually estimated through demeaning, that is, by estimating $(y_{it} - \overline{y}_i) = \beta(x_{it} - \overline{x}_i) + (\varepsilon_{it} \overline{\varepsilon_i})$. This transformation effectively gets rid of the Level 2 error (u_i), and therefore, all time-constant unobserved confounders are controlled for, whether known or unknown, measured or unmeasured (Wooldridge 2010). However, fixed effects models cannot estimate the effect of time-constant covariates, because effects are estimated solely based on variation within respondents. We compute both models because we are also interested in estimating the effect of country of origin. We employ the Hausman test to assess if the estimates obtained from the random effects models are biased (Wooldridge 2010).
To test the robustness of our results and to check for differential vulnerability, we additionally checked for differences in the effect of perceived discrimination by gender and by countries of origin.
The second set of analyses is directed to assess the reverse relationship, that is, if poor mental health is associated with an increased probability to report discrimination in the subsequent period (t + 1). Logistic random and fixed effects models (also known as conditional likelihood models, Wooldridge 2010) have been computed to investigate this possibility. The Hausman test is also used to compare the estimates obtained from both models.
Cluster robust standard errors have been computed for all models to correct for possible heteroskedasticity and serial correlation within clusters (Wooldridge 2010). All analyses have been conducted using Stata 13.1.

Results

Table 1 shows the distribution of the study variables in our sample of immigrants. Respondents are on avarege 46.5 years old, and there are slightly more women than men in the sample. MCS and PCS have, by the way they are constructed (see above), a mean of approximately 50 and a standard deviation of approximately 10. The majority of respondents in our sample (60%) reports to have never experienced any discrimination because of their origin. About one-third of the respondents (34%) indicates that they have seldom experienced discrimination and around 6% report that they have experienced discrimination often.
Table 1 also shows the distribution of the study variables differentiated by the reported frequency of perceived discrimination. Mean values of MCS and PCS are lower

among those respondents who report to have experienced discrimination often (MCS: 44.6, PCS: 45.7) and seldom (MCS: 48.1, PCS: 48.7) compared with those who report not to have experienced discrimination the last two years (MCS: 51.3, PCS: 50.8). The profile of those who experience discrimination differs compared to those who do not experience discrimination. Respondents who report having experienced discrimination often have a lower socioeconomic position, indicated by labor force status and income quintiles, than those who report having experienced discrimination only seldom or never. Table 2 shows that the probability to report perceived discrimination varies by country of origin. Immigrants from Turkey most often report discrimination.

The multivariate results presented in Table 3 are consistent with the notion that experienced discrimination affects mental and physical heath (Hypotheses 1 and 3). As Model 1 shows, there is a statistically significant and substantial association between experiencing discrimination and MCS (often $\beta = -4.673$, SE = 0.484, seldom $\beta = -2.210$, SE = 0.217). Model 2 presents the results from the fixed effects model. The estimated effects of discrimination on mental health are smaller, but still statistically highly significant (often $\beta = -2.458$, SE = 0.566, seldom $\beta = -1.061$, SE = 0.258). A Hausman test ($\chi^2(20) = 109.189$) suggests that the random intercept model may overestimate the strength of the association. A similar picture emerges when looking at the results for physical health (Table 3, Models 3 and 4). Both the random effects (often $\beta = -3.798$, SE = 0.432, seldom $\beta = -1.735$, SE =0.196) and fixed effects model (often $\beta = -1.961$, SE = 0.498, seldom $\beta = -1.002$, SE = 0.230) estimate statistically significant effects of perceived discrimination on PCS. Again, a Hausman test ($\chi^2(20) = 90.789$) indicates that the fixed effects model should be preferred, as the estimates from the random effects model may be inconsistent due to time-constant unobserved heterogeneity.

Model 5 (Table 3) tests Hypothesis 5 that the effect of discrimination on physical health is mediated by its effect on mental health. This seems to be the case. Including MCS as a control variable in the fixed effects model results in a large reduction of effect sizes of perceived discrimination and turns the estimated effects statistically insignificant (often $\beta = -0.314$, SE = 0.329, seldom $\beta = -0.291$, SE = 0.156), while MCS itself is positively and significantly related to PCS ($\beta = 0.670$, SE = 0.010).

The results concerning the test of potential reverse causality (Hypotheses 2 and 4) between mental and physical health and perceived discrimination are presented in Table 4. The dependent variable in these models is reported discrimination (never vs. seldom/often) from the subsequent survey period (t + 1), which reduces the sample (see Methods). The results obtained through the random effect logistic regression model

Table 2. Reported discrimination by country of origin (SOEP 2002-2010; n = 8307).

	Perceived discrimination[a, b]			
Country of origin:	Often	Seldom	Never	Total
Turkey	185 (9.32)	929 (46.80)	871 (43.88)	1985 (100)
Former Yugoslavia	45 (4.19)	351 (32.71)	677 (63.09)	1073 (100)
Greece/Italy/Spain, or Portugal	47 (3.43)	368 (26.88)	954 (69.69)	1369 (100)
East-Europe/Russia	150 (5.66)	883 (33.33)	1616 (61.00)	2649 (100)
Other country of origin	73 (5.93)	315 (25.59)	843 (68.48)	1231 (100)

[a] % in parenthesis.

[b] Pearson $\chi^2(8) = 323.74$, $p<0.001$.

Table 3. Random and fixed effects regression of the SF-12 MCS and PCS on perceived discrimination (SOEP 2002–2010).

	1. MCS, random intercept[a]		2. MCS, fixed effects[b]		3. PCS, random intercept[a]		4. PCS, fixed effects[b]		5. PCS, fixed effects[b]	
	β	SE	β	SE	β	SE	β	SE	β	SE
Discrimination: often	-4.673***	0.484	-2.458***	(0.566)	-3.798***	0.432	-1.961***	0.498	-.314	0.329
Discrimination.: seldom	-2.210***	0.217	-1.061***	(0.258)	-1.735***	0.196	-1.002***	0.230	-.291	0.156
Discrimination: never	Ref.		Ref.		Ref.		Ref.		Ref.	
SF-12: Summary scale mental health (MCS)									.670***	0.010
Country of origin										
Turkey	0.267	0.585			0.525	0.552				
Former Yugoslavia	Ref.				Ref.					
Greece/Italy/Spain, or Portugal	0.407	0.617			0.749	0.598				
East-Europe/Russia	0.748	0.601			1.129*	0.572				
Other country of origin	1.173	0.639			1.741**	0.618				
Constant	57.364***	0.746	60.078***	(1.935)	62.466***	0.676	63.357***	1.689	23.108***	1.196
R^2 within	0.023		0.026		0.032		0.036		0.587	
R^2 between	0.194		0.146		0.322		0.284		0.807	
R^2 overall	0.153		0.115		0.254		0.223		0.760	
Observations	8307		8307		8307		8,307		8307	
Respondents	2851		2851		2851		2,851		2851	

[a]Adjusted for age, gender, marital status, level of education, adjusted net household income (quintiles), labor force status, nationality, and year of survey.
[b]Adjusted for age, marital status, level of education, adjusted net household income (quintiles), labor force status, nationality, and year of survey.
*p < .05, **p < .01, ***p < .001, cluster robust standard errors in parentheses

Table 4. Random and fixed effects logistic regression of perceived discrimination (t+1) on MCS and PCS (SOEP 2002-2010)

	1. Random intercept[a]		2. Fixed effects[b]	
	OR	95% CI	OR	95% CI
SF-12: Summary scale mental health (MCS)	0.970***	(0.956, 0.985)	1.002	(0.983, 1.022)
SF-12: Summary scale physical health (PCS)	0.990	(0.973, 1.007)	0.989	(0.968, 1.010)
Country of origin				
Turkey	2.837***	(1.918, 4.196)		
Former Yugoslavia	Ref.			
Greece/Italy/Spain, or Portugal	0.611*	(0.389, 0.960)		
East-Europe/Russia	1.094	(0.717, 1.667)		
Other country of origin	0.904	(0.571, 1.429)		
Constant	6.932***	(2.837, 16.941)		
Log likelihood empty model	-4169.612		-137.800	
Log likelihood full model	-4019.853		-1119.437	
Observations	7133		3026	
Respondents	2417		799	

[a]Adjusted for age, gender, marital status, level of education, adjusted net household income (quintiles), labor force status, nationality, and year of survey.
[b]Adjusted for age, marital status, level of education, adjusted net household income (quintiles), labor force status, nationality, and year of survey.
* p<.05, ** p<.01, *** p<.001, 95% confidence intervals based on robust standard errors (bootstrapping, 300 repetitions) in parentheses.

indeed indicate that immigrants with higher MCS scores have a lower likelihood of reporting discrimination in the following period (OR = 0.970, 95% CI = 0.956-0.985), and therefore, that immigrants with poorer mental health have a higher likelihood of reporting discrimination. However, the fixed effects model comes to a different conclusion: the estimated effect of MCS on the likelihood of reporting discrimination approaches zero and is no longer statistically significant (OR = 1.002, 95% CI = 0.983 -1.022). A Hausman test suggests that the estimates obtained through the random effects model are inconsistent ($\chi^2(20) = 91.132$). PCS is not statistically significantly associated with the likelihood of reporting discrimination, neither in the random effects nor in the fixed effects model. Overall, the data, therefore, provide little support for the hypotheses that poor mental or physical health leads to an increased probability to report discrimination.

The multivariate results (Model 1, Table 4) also show that the immigrant groups differ in their likelihood of reporting experiences of discrimination. Compared with immigrants from former Yugoslavia, immigrants coming from Turkey have a higher likelihood of reporting discrimination (OR = 2.837, 95% CI = 1.918-4.196), whereas immigrants coming from Southern European countries have a lower likelihood (OR = 0.661, 95% CI = 0.389-0.960).

To assess if different immigrant groups display a differential vulnerability in the health consequences of perceived discrimination, we conducted additional analyses stratified by country of origin. However, the results (Table 5) do not indicate that the association between perceived discrimination and mental and physical health is moderated by country of origin. To test the robustness of our results, we also conducted

Table 5. Fixed effects regression of the SF-2 MCS and PCS on perceived discrimination interacted with country of origin (SOEP 2002-2010)

	1. MCS, fixed effects[a]		2. PCS, fixed effects[a]	
	β	SE	β	SE
Discrimination: often	-2.623**	1.001	-2.235*	0.891
Discrimination: seldom	-1.626***	.436	-1.247**	0.401
Discrimination: never	Ref.		Ref.	
Interactions with country of origin (ref: East-Europe/Russia)				
Turkey				
x discrimination: often	.623	1.389	0.935	1.248
x discrimination: seldom	.942	.644	0.737	0.592
Former Yugoslavia				
x discrimination: often	-0.218	1.814	-1.647	1.527
x discrimination: seldom	0.536	0.803	0.036	0.692
Greece/Italy/Spain, or Portugal				
x discrimination: often	-.946	1.745	-0.037	1.515
x discrimination: seldom	0.467	0.759	0.110	0.706
Other country of origin				
x discrimination: often	0.294	2.014	0.518	1.610
x discrimination: seldom	1.214	1.029	-0.069	0.857
Constant	60.057***	1.935	63.432***	1.693
R^2 within	0.027		0.037	
R^2 between	0.147		0.284	
R^2 overall	0.115		0.222	
Observations	8307		8307	
Respondents	2851		2851	

Note: Insignificant interaction coefficients between countries of origin and perceived discrimination indicate that there are no group specific effects of perceived discrimination on MCS or PCS.
[a]Adjusted for age, marital status, level of education, adjusted net household income (quintiles), labor force status, nationality, and year of survey.
* p<.05, ** p<.01, *** p<.001, cluster robust standard errors in parentheses.
additional analyses stratified by gender. The results similarily suggest that there are no gender differences in the relation between perceived discrimination and mental and physical health (results available on request).

Discussion

Subjectively perceived discrimination seems to be associated with a decrease in selfreported mental and physical health in immigrants in Germany. Although Germany is one of Europe's major receiving countries, with a sizable share of immigrants among its population, this study is the first to use German longitudinal data to investigate the link between discrimination and health outcomes. The analyses indicate four main findings. First, perceived experiences of discrimination based on being a member of an immigrant group in Germany are associated with a significant decrease in mental health. Second, perceived discrimination also appears to impair immigrants' physical health. These findings are in line with prior research on discrimination and health, using longitudinal data (Brody, Kogan, and Chen 2012; Pavalko, Mossakowski, and Hamilton 2003; Schulz et al. 2006; Barnes et al. 2008). Third, the relationship between perceived discrimination and physical health is completely mediated by the effect of discrimination on mental

health. Thus, it appears that perceived discrimination affects mental health and subsequently physical health. Fourth, our analyses do not provide robust evidence for a reverse relationship: poor health does not seem to increase the probability to report experiences of discrimination (Gee and Walsemann 2009).

The effects of perceived discrimination on adverse health outcomes do not differ gender or between immigrants coming from different countries of origin. Consistent with previous research, we thus do not find evidence of a differential vulnerability to perceived discrimination between different groups (Gee and Walsemann 2009; Kessler, Mickelson, and Williams 1999; Krieger and Sidney 1996). However, there is strong evidence for differential exposure (Kessler, Mickelson, and Williams 1999) in our data. Turkish immigrants are especially likely to report experiences of discrimination. Among the major immigrant groups in Germany, immigrants coming from Turkey are often considered as being culturally most distant from the nonimmigrant population (Alba 2005). Since the construction of differences and boundaries is necessary for prejudiced behavior, including discrimination (Alba and Nee 2003; Allport 1954), this result is not surprising. Consequently, if certain immigrant groups are more prone to experience discrimination, this implies that differential exposure may contribute to the emergence of health disparities between different ethnic groups (Gee and Ford 2011; Dominguez et al. 2009).

This study has a number of limitations. The most obvious one concerns the measure of discrimination available in the SOEP data. Although discrimination is a multidimensional phenomenon, we cannot distinguish different forms of perceived discrimination, which may range from derogatory everyday interactions to discrimination on the housing or job market to violent actions. We have to assume that these types of discriminatory actions vary both in their frequency and in their health effects. Future research should scrutinize our results using multi-item questions differentiating different forms of discriminatory experiences (Bastos et al. 2010). Moreover, this study relies, as all survey studies, on self-reported perception of discrimination, and we are unable to ‘objectively' assess discrimination. However, subjective perceptions matter because people act and react to what they perceive to be true – ‘if men [persons] define situations as real, they are real in their consequences' (Thomas and Thomas 1928, 527). In addition to that, we have used self-rated mental and physical health and thus no additional health outcome variables. Nevertheless, other studies have shown that there is an association between discrimination and other health outcomes, e.g. cardiovascular diseases, cancer, or substance abuse (e.g. tobacco or alcohol; Chae et al. 2012; Lewis et al. 2006; Taylor et al. 2007; Fuller-Rowell et al. 2012). Moreover, we have to rely on a somewhat crude differentiation between different countries or regions of origin. This is a necessity in order to retain sufficient cell frequencies for the multivariate analyses. Nonetheless, if larger data-sets are available, more precise differentiations between different ethnic groups and countries of origin should be used to further investigate potential differences in exposure and vulnerability to perceived discrimination.

A word of caution also seems warranted regarding the statistical models. It is a difficult task to draw causal inferences from nonexperimental data, even from longitudinal data. Although the models employed, in particular the fixed effects models, offer invaluable advantages (Wooldridge 2010) and we have checked for possible reverse causality, the results are still only statistical associations that warrant careful interpretations.

As regards to the quality of the data and possible implication of our results, two issues should be discussed. First, it is likely that immigrants who are better integrated in the

German society are more likely to participate in surveys and, since participation in the SOEP is based on legal residency in Germany, some immigrant groups, e.g. undocumented immigrants, are not represented at all in the data. Thus, although the SOEP may represent the major immigrant groups in Germany quite well, it does not capture the whole immigrant population. This may lead to an underestimation of the incidence of perceived discrimination if we assume that legal and well-integrated immigrants are less often subject to discriminatory actions. Second, the follow-up rate in the data is acceptable. Additional analyses show (available on request) that it is not related to mental and physical health. Younger immigrants, male immigrants, and immigrants who are not single are more likely to suffer from attrition. Accordingly, our models adjust for these characteristics. However, perceived discrimination is related to attrition. Respondents who report discrimination, regardless of whether this is experienced often or seldom, are more likely to drop out of the survey as compared with those who do not report to have experienced discrimination. The immigrants remaining in the sample, therefore, become positively selected over time with regard to reporting experiences of discrimination. This, too, may lead to an underestimation of the prevalence of reported discrimination. Consequently, health inequalities between different groups of immigrants and nonimmigrants caused by differential exposure may also be underestimated.

This study has opened the black box between perceived discrimination and health to some extent by showing that the effect on physical health is mediated by the effect of discrimination on mental health. Yet, the underlying etiological pathway is still not fully understood (Pascoe and Richman 2009; Williams, Neighbors, and Jackson 2008). Our results indicate that a stress-theoretical conception (Clark et al. 1999; Chae et al. 2012; Pearlin et al. 2005) is plausible, not only because of the mediating effect of mental health but also because the effect of discrimination on mental health is stronger than on physical health. Yet questions remain with regards to the exact underlying processes as well as with regards to the distinction between possible direct and indirect (e.g. through health-risk behavior) effects (Pascoe and Richman 2009). A more direct test of the assumed stress model will aid our understanding on the exact pathway through which discrimination may impact health.

Moderating and mediating factors for the relationship between discrimination and health, such as socioeconomic position, social support, coping mechanisms, or personality characteristics, should be included in future research (Ajrouch et al. 2010; Williams and Williams-Morris 2000; D'Anna, Ponce, and Siegel 2010). For instance, research on the incorporation of immigrants has shown that contextual factors, like ethnic communities, national institutions, and welfare state arrangements play an important role in shaping incorporation outcomes (Kogan 2006; Schunck and Windzio 2009). Different contexts of reception may, therefore, moderate and mediate exposure to and the effect of discrimination (Dailey et al. 2010). Not only will this help to further understand the causes and consequences of discrimination, it may also prove valuable as to understand how (exposure to) discrimination can be reduced and how such apparently harmful experiences may be buffered.

Conclusion

Our study supports the notion that experiences of discrimination affect self-reported mental and physical health of immigrants in Germany. The results suggest that this is not a mere correlation. Perceptions of discrimination seem to have a detrimental effect on

mental and physical health. Discrimination seems to affect physical health via mental health. The analyses also suggest that the direction of the association runs from perceptions of discrimination to health and not vice versa. Discrimination does not have to be perceived on a frequent basis to have a negative effect on health: occasional discrimination poses a health risk as well. The analyses also show that different immigrant groups perceive discrimination with different frequency. As ethnic discrimination due to origin is not experienced by members of the majority population and differentially experienced by different immigrant groups, it may contribute to the production of inequalities between these groups. Thus, our findings help to establish mechanisms leading from heterogeneities (in terms of immigrant status) to inequalities. As the inequalities observed have negative repercussions on health and are potentially avoidable, they can be considered as inequities. Germany is a country which attempts to implement nondiscriminatory policies as the Charter of Fundamental Rights of the European Union (Articles 21 and 35) and the German national General Equal Treatment Act ("Allgemeines Gleichbehandlungsgesetz"); yet these do not seem to suffice to prevent discriminatory experiences. Thus, more research is needed to identify mechanisms that lead to perceptions of discrimination among immigrants and strategies or interventions to reduce (perceived) discrimination in all settings. A first necessary step lies in the empirical appraisal of a more fine-grained assessment of different dimensions of (perceived) discrimination. Given the effects of discrimination on health, this constitutes an urgent public health challenge.

Key messages

(1) Perceived experiences of discrimination based on being a member of an immigrant group in Germany are associated with a significant decrease over time in self-reported in mental and physical health.
(2) The relationship between perceived discrimination and physical health is completely mediated by the effect of discrimination on mental health.
(3) Certain immigrant groups are more prone to experience discrimination. Hence, this differential exposure may contribute to the emergence of health disparities between different ethnic groups.
(4) Self-reported poor health does not seem to increase the probability to report experiences of discrimination.

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